

REMARKS

Claims 37, 42-60, 64, and 68-74 are pending in this application. Claims 37, 42-59, and 74 are allowed. Claim 70 has been amended to depend from allowed claim 51. Claim 75 is canceled without prejudicing Applicant's rights to pursue these claims in a continuation.

Substance of Interview

Applicants would like to thank the Examiner for meeting with the undersigned Mr. Hayden on August 25, 2005, and for allowing Ms. R. Tollervey to observe the interview.

Regarding independent claim 60 claiming a CMP slurry comprising aluminum nitrate, which stands rejected over any of Imai, Mandigo, and Easter in view of Uchikura, Mr. Hayden explained how the invention described in claim 60 was distinguishable from the cited art substantially following the argument relating to what was disclosed in the cited art and the function of pH as presented *infra*. The Examiner was receptive to the arguments regarding the pH. Mr. Hayden then inquired whether reciting an extremely limiting pH range of from about 5.1 to 5.5 would put claim 60 in condition for allowance. The Examiner stated that such an amendment would require an additional search, and could be done if Applicants filed an continuation or an RCE.

Regarding claim 68, Applicants noted that the claim stood rejected under 35 USC 112 as being new matter. Applicants proposed amending claim 68 to recite that the secondary oxidizer is selected from aluminum nitrate, hydrazine, hydroxylamine nitrate, and nitric acid, citing as support the last 2 sentences in paragraph 16. Applicants also noted the 35 USC 112 rejection of claim 73 was in error, as the composition already recited water and as hydrazine was mentioned in the specification (see the last 2 sentences in paragraph 16). The Examiner opined that while the changes proposed would overcome the existing rejections, the changes would not make the claims allowable, citing law that it is obvious to use two components to do the same task as one compound. The Examiner opined that providing test data with ammonium nitrate and hydrogen peroxide (cited in the references as another useful oxidizer) was not useful might be helpful in overcoming this obviousness argument.

Agreement was not reached regarding either of claim 60 nor claim 68.

Regarding Claims 60 and 64:

The Examiner's position regarding claim 60 is that while none of the primary references Imai, Mandigo, and Easter teach aluminum nitrate, "any conventional oxidizer would have been

obvious (the references imply that any conventional oxidizer can be used) and since an aluminum salt (i.e., nitrate) is a conventional polishing oxidizer as shown by the secondary reference, one skilled in the art would have found it obvious to use aluminum nitrate as the oxidizer.” See the instant Office Action, page 3. The phrases regarding oxidizers in the primary references that the Examiner was relying on are in fact not unlimited. Mandigo states useful oxidizers are those

such as hydrogen peroxide, an iodate such as potassium iodate, a nitrate such as cesium nitrate, barium nitrate, ammonium nitrate, and/or mixtures of ammonium nitrate and cesium nitrate, a carbonate such as ammonium carbonate, a persulfate such as ammonium persulfate and/or sodium persulfate and perchlorates.

To imply this statement suggests any conventional oxidizer is to completely ignore the phrase “such as.” Mandigo does not mention aluminum salts nor aluminum nitrate. Applicants find no disclosure in any of the references that aluminum nitrate is a nitrate “such as” cesium nitrate, barium nitrate, or ammonium nitrate, or is an oxidizer such as hydrogen peroxide, etc. Similarly, Easter states

Any suitable oxidizing agent known in the art for CMP polishing can be used in the present invention. Examples of oxidizing agents include but are not limited to H_2O_2 , $Fe(NO_3)_3$, H_3PO_4 , HNO_3 , $KMnO_4$, KIO_3 , $K_3F(CN)_6$, $Ce(NO_3)_4$ and ammonium salts such as ammonium persulfate and ammonium nitrate.

To read this as meaning any conventional oxidizer is to completely ignore the word “suitable.” Indeed, at column 7 lines 13-16 Easter qualifies his first statement by stating:

“Any suitable oxidizing agent for polishing the material used in the liner film (e.g. tantalum or tantalum nitride) can be used.

Easter does not mention aluminum salts nor aluminum nitrate. Finally, Imai describes a CMP composition having an oxidizing agent selected from “hydrogen peroxide, ammonium hydroxide, ammonium nitrate, ammonium chloride, and others.” See Imai at column 15, lines 16-18. Imai states that at a pH of <7 or >12.5 , water is corrosive to copper, but the addition of oxidizers and other compounds can affect the pH at which a composition is corrosive. See Imai, at column 14, lines 65-68, and column 15, lines 3-14:

the example of the figure is in the H₂O system and ranges of the corrosive regions are changed when another reactant is included in a polishing liquid. The corrosive regions shown in this embodiment are defined on the basis of whether or not a polishing liquid including such additives includes materials which provide a polishing liquid in a combined range of values of pH and an oxidation-reduction potential that corrodes a metal.

The Examiner believes he can simply insert any known oxidizer into any of the three references cited above to obtain the cited invention. Such is not the case. At most the three references state that some other oxidizer might be useful, but that you should look at pH when evaluating oxidizers. The Examiner relies on Uchikura to provide disclosure of aluminum nitrate. Uchikura describes a CMP composition, and lists a somewhat unlimited number of oxidizers, which also do not specifically list aluminum nitrate. Uchikura in paragraph [0102] specifically mentions nitrates of iron, and mentions in a list “aluminum salts” which can arguably be said to include nitrates. Uchikura in paragraph [0109] teaches the pH of his composition is from 7 to 11. There is no motivation for one skilled in the art to look to Uchikura, reciting a useful pH of 7-11, for an oxidizer for a composition of: Mandigo who states in column 3, lines 36-42, that the pH is “under 5 and preferably about 2.8 to 4.2”; Easter who states in column 7, lines 22-25, that “the pH of the second polishing slurry can be from about 1 to about 6, preferably from about 2 to about 4”; or Imai, where the only recitation of pH is at a pH of <7 or >12.5). Applicants respectfully request this rejection of claim 60 and dependent claim 63 be reconsidered and withdrawn.

Regarding Claim 68-73:

Claim 68 stands rejected under 35 USC 112, first paragraph, where the Examiner’s position is the claimed subject matter was not described in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. The Examiner focused on Table Ex, which Applicants had pointed to for support for said claim, in stating there was support for only one additional oxidizer, a hydrazine solution, to be combined with ammonium nitrate. Further, the Examiner stated there was only support for DI water, not the more generic water. Applicants traverse. Support for the claim and for the specific language used in the claim can also be found in the last line of paragraph 16, which states:

Oxidizers include hydroxylamine nitrate, nitric acid, ... ammonium nitrate, aluminum nitrate, hydrazine, and mixtures thereof in aqueous solution.

Applicants respectfully request the 35 USC 112 rejections to claims 68-73 be reconsidered and withdrawn.

The Examiner also rejected claim 73 as reciting new matter, because the table showed a hydrazine solution while the claim merely recited hydrazine. First, as the independent claim recites a composition comprising water, it is redundant to recite that the second oxidizer in said composition is a hydrazine solution (hydrazine and water). Second, the paragraph 16 is alternate support for the word "hydrazine." The Examiner rejected claim 70 as reciting new matter, because "the pH is not defined for a two oxidizer slurry that contains ammonium hydroxide." Applicants appreciate the Examiner's diligence in catching this. The pH of about 5.1 to about 5.5 was intended to be recited for a polishing composition containing aluminum nitrate, as shown on page 12 of the specification in table Dx and in paragraph 32. This claim was therefore amended.

Claim 68 stands rejected as being obvious over Imai and/or Easter in view of Uchikura, or alternatively over Mandigo. The claim recites a composition

consisting essentially of a first oxidizer of ammonium nitrate, at least one abrasive, at least one second oxidizer different from the first oxidizer, optionally a corrosion inhibitor, and water.

Easter is not particularly concerned with the liquid components of his slurry, but states "the abrasive particles are typically provided in an aqueous dispersion that can include buffers or other additives." Imai recites a composition that includes an organic acid. Uchikura states in paragraph 19 that "that by using an aqueous dispersion with a specific composition containing a heterocyclic compound, an organic acid, an oxidizing agent and if necessary a surfactant, it is possible to easily adjust the polishing rate ratios for the copper film, barrier metal film and insulating film, and to efficiently polish the copper film and barrier metal film." In some cases Uchikura only requires a "polishing rate adjusting component" which is an organic acid, particularly maleic acid. The Examiner's position is this art is still pertinent because the Examiner believes the organic acid will not materially affect the basic and novel properties of the composition absent evidence to the contrary.

Applicants note that the rejections of claims 60 and 68 rely on two principals: 1) though the disclosures teach only selected oxidizers, the rejection is based on the hypothesis that the disclosures teach any oxidizer; and 2) though the disclosures require organic acids, the rejection is based on the hypothesis that the organic acids are not material. To summarize the rejection, the invention of claim 68 is obvious over the combination of references because it doesn't matter what compounds (oxidizers) are not taught because any replacement can be used, and it doesn't matter what compounds (organic acids) are taught because these compounds are not material unless proven otherwise. Fortunately, it is possible to prove otherwise. Uchikura states, regarding the materiality of the organic acid, at paragraph [0099]:

If the maleic acid ion concentration is less than 0.005 mole/liter, the polishing rate may be inadequate particularly for copper films and barrier metal films. On the other hand, if the maleic acid ion concentration is greater than 1 mole/liter the polishing surface may undergo corrosion, and it may not be possible to obtain a satisfactory finished surface with high precision. If the organic acid content is less than 0.01 wt %, it may not be possible to polish copper films and barrier metal films at an adequate rate, and the stability of the aqueous dispersion is reduced. Adding the organic acid at 5 wt % sufficiently improves the polishing rate, and there is no need to increase the content above this.

Uchikura also states at paragraph [0117]:

If the organic acid content is less than 0.01 wt %, it may not be possible to polish copper films and barrier metal films at an adequate rate, and the stability of the aqueous dispersion is reduced. Adding the organic acid at 5 wt % sufficiently improves the polishing rate, and there is no need to increase the content above this.

This text in the art cited by the Examiner is strong evidence of the materiality of the organic acid, which means these references should not be used to create a prima facie case against a composition consisting essentially of components not including the organic acid.

Claim 68 also stands rejected as being obvious over Mandigo, where the Examiner's position is this art is still pertinent because the Examiner believes the polyacrylic acid recited in

Mandigo will not materially affect the basic and novel properties of the composition absent evidence to the contrary. Mandigo states:

the polishing fluid contains about 0.1 to 1.0% by weight, based on the weight of the composition, of polyacrylic acid or a blend or mixture of polyacrylic acids ... One particularly preferred blend comprises a polyacrylic polymer having a low number average molecular weight of about 30,000 and a polyacrylic polymer having a high number average molecular weight of about 250,000 in a 1:1 weight ratio. ...

That is, Mandigo requires a polyacrylic acid. Regarding other components, Mandigo states:

The polishing fluid also typically contains oxidizers, chemicals enhancing metal solubility (chelating agents or complexing agents), and surfactants. Polishing fluids containing abrasives also have additives such as organic polymers which keep the abrasive particles in suspension.

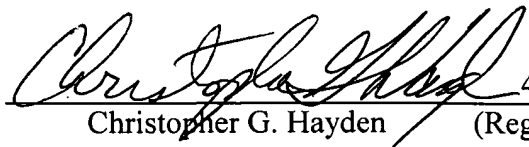
Typical complexing agents are malonic acid, gluconic acid, glycolic acid, citric acid, phthalic acid, pyrocatechol, pyrogallol, gallic acid, or tannic acid.

That is, the polishing compound of Mandigo must include a polyacrylic acid, and may include oxidizers and chelating agents such as organic acids. The ONLY materials Mandigo requires for his slurry are water and polyacrylic acids. This alone is ample evidence of the materiality of the polyacrylic acids. Applicants respectfully request the obviousness rejections of claims 60, 68, and claims depending therefrom be reconsidered and withdrawn.

No fee is believed necessary relating to this response – however, if any additional fees are deemed necessary for any reason, the Office is authorized to charge them to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310.

Respectfully submitted,

Date August 30, 2005

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